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Common Dilemmas: Research Programs in
Common-Pool Resources and International Cooperation

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Research on common-pool resources (CPRs) and on cooperation among states has proceeded along two separate tracks, responding to the theoretical and empirical challenges posed by the substantive issues inherent in each field. The development of these two research programs has been neither entirely parallel nor entirely independent of one another, as they have drawn on a common pool of intellectual resources, primarily game-theoretic work on collective action problems. The training of individuals in each field and the nature of the empirical issues they confront has led each research program to develop particular strengths and weaknesses. Researchers are now beginning to recognize the synergy available from directly confronting these research programs with one another, for example by asking what each has to say about the problem of cooperation on global environmental issues.

This paper moves toward collaboration, by presenting simplified summaries of work being done within each research program and suggesting points in each that may contribute to synergistic progress. The first section lays out in skeletal fashion the central concerns, assumptions, and results of the two programs, arguing that the development of each has been constrained by the need to respond to dominant paradigms. The second section examines the ability of each program to explain

variation in outcomes, considering answers to questions about observed instances of failure and success of cooperative efforts. The third section then turns to points of divergence between the two programs. Although they focus on similar problems, important differences in substance suggest a need for caution in directly transporting the results of one research program into the other.

Establishing the Possibility of Decentralized Cooperation.

Both the research program in common pool resources and that in international cooperation began with and have concentrated on responding to a particular dominant paradigm. In both fields this paradigm is a variation of Hobbes' Leviathan, with assertions about the inability of individuals to solve collective action problems without centralized enforcement. Those who study CPRs have had to confront the widely-held notion that only government intervention can save the commons from destruction through rational overuse by individuals. Those who study international cooperation have similarly had to respond to realist analyses, particularly hegemonic stability theory, which argue the inevitable collapse of cooperation without the exercise of power by a self-interested dominant state. Thus, both research programs have been engaged in a kind of "existence proof," preoccupied with establishing theoretically and empirically that decentralized cooperation can occur. While a necessary first step, I would argue that research needs now to progress beyond such existence proofs to confront problems of

explaining variation in institutional design and in outcomes.

In the conclusion to Governing the Commons, Elinor Ostrom says that "if this study does nothing more than shatter the convictions of many policy analysts that the only way to solve CPR problems is for external authorities to impose full private property rights or centralized regulation, it will have accomplished one major purpose."¹ Similarly, in After Hegemony Robert Keohane uses theoretical and empirical analysis to establish that international cooperation is not dependent on continued American dominance of international politics. "[E]ven on the restrictive assumptions of Realism and game theory, gloomy conclusions about the inevitability of discord and the impossibility of cooperation do not logically follow."² These two influential books directly confront the logic of collective action, developed primarily by economists, with its pessimistic conclusions about the possibility of decentralized cooperation.

Pessimism about collective action has a long and illustrious pedigree. Political scientists refer to Hobbes' Leviathan, drawing analogies between international politics and his description of a war of all against all. Charles Kindleberger, an economic historian, noted that states have available to them one way to escape from their rational refusal to cooperate. The solution he finds is hegemony, in which one powerful state exercises either coercive or benevolent leadership, thus solving states' collective action problem.³ The realist school of international relations further developed this insight into the

theory of hegemonic stability. Realists assume that states are the major actors in international politics, model them as rational unitary actors, and assume that they confront conflicts of interest in an anarchic environment. Thus, power becomes a key source of explanatory power in realist analyses, and arguments that only the self-interest of a powerful state could allow solution of cooperation problems are claimed to follow.⁴

Among those who study common-pool resources, the dominant paradigm requiring confrontation was developed by economists' analysis of collective action problems. Like political scientists, economists often concluded that only centralized mechanisms could provide a solution. Garrett Hardin's compelling analysis of the "tragedy of the commons" built on assumptions of rational behavior similar to those used by realists and came to the conclusion that decentralized individual behavior could not lead to an optimal outcome.⁵ The logic underlying this analysis is that of the Prisoners' Dilemma, in which the rational individual decision is to refuse to cooperate regardless of others' behavior, leading to the destruction of exhaustible common resources. Early analyses of CPR and other collective action problems found little room for rational, self-interested individuals to overcome the significant barriers to cooperation inherent in the structure of such problems.⁶ For the commons, solutions were claimed to require government intervention either to administer a centrally-managed regime limiting access, or to eliminate the commons entirely through a process of

privatization.

As the tools of game theory developed, analysis of collective action became more nuanced. The pessimistic conclusions of earlier models were shown to depend on restrictive assumptions, many of which were inadequate simplifications of empirical problems. On the purely theoretical level, techniques for solution of iterated games revealed extensive possibilities for cooperative yet decentralized equilibria. The most general statement of these findings is the Folk Theorem, which demonstrates that with iteration, low discount rates, and punishment strategies, any cooperative equilibrium that gives payoffs higher than those of the one-shot defection equilibrium can be sustained.⁷ Given some uncertainty about payoffs, even finite iteration can allow cooperative solutions without external enforcement.⁸ In a work accessible to those without training in game theory, Robert Axelrod demonstrated with computer experiments that strategies of specific reciprocity allowed players to cooperate in repeated Prisoners' Dilemmas.⁹

Theoretical analyses thus provided the framework for thinking about multiple solutions to collective dilemmas. Clearly, any assumption that only external intervention could be effective in all circumstances has no logical basis. In fact, current theoretical work suggests just the opposite--that often the problem is one of too many sustainable solutions and the difficulty of choosing among them.¹⁰ Disturbed by the normative implications of analyses such as Hardin's and Olson's, and by

empirical anomalies of successful decentralized cooperation, students of CPRs and international politics applied the more optimistic models to their substantive problems to demonstrate that individuals and states have successfully found ways to overcome collective action dilemmas.

Behavior in common-pool resources reveals the multiplicity of real-world solutions. These resources are characterized by the difficulty of exclusion, so that many individuals potentially can withdraw resources, and by subtractable yield, so that the resource is exhaustible.¹¹ Unlike the case of pure public goods, resources taken by one individual are not available to others, so that CPRs are subject to "crowding effects." Typical examples of CPRs include fisheries, irrigation systems, and pastures, in which multiple "appropriators" withdraw units from a finite resource base, often running the risk of overusing the resource and thus decreasing its value. Usually, some optimal level of withdrawal exists (even if it is not common knowledge), above which yields from the resource begin to decline and all appropriators are worse off. Individual behavior in the absence of common understandings, rules, and norms can thus be modeled as a Prisoners' Dilemma. However, empirical and theoretical work has found that appropriators can develop, usually through a process of trial-and-error, norms and rules that prevent resource depletion and limit access. Ostrom discusses mountain grazing in Switzerland, forest CPRs in Japan, and irrigation systems in Spain and the Philippines as examples of "long-enduring, self-

organized, and self-governed CPRs."¹² Such rule systems have at times allowed cooperative solutions to exist and appropriators to prosper for hundreds of years.

From the perspective of policy analysis, demonstration of such success has been needed due to misapplication of ideas about commons tragedies by governments, which has created tragedies of its own. Drawing the lesson that external intervention was necessary to solve CPR dilemmas, governments have at times assumed that individuals cannot have optimally solved them and intervened with either new rules or attempts at privatization. Such efforts often destroy a fragile decentralized cooperative equilibrium, just as changes in technology or access can. Examples of such destructive although apparently well-intentioned intervention include fisheries in Nova Scotia and Norway.¹³ In Norway, government regulation responded to technological changes that led to collapse of fish stocks, but may have exacerbated rather than solved the problem. Thus the demonstration that decentralized solutions do exist has had both theoretical and practical urgency. As Ostrom argues, decentralized solutions involve the construction of appropriate and accepted rules governing access to the CPR. "The core of organization involves changes that order activities so that sequential, contingent, and frequency-dependent decisions are introduced where simultaneous, noncontingent, and frequency-independent actions had prevailed."¹⁴

Thus, attention among those studying CPRs has turned to the

organizational forms that have allowed individuals to solve their common problems. This involves the evolution or intentional construction of institutions, considered as sets of rules constraining individuals' behavior.¹⁵ Among students of international cooperation, attention has also turned to international institutions or regimes as mechanisms that allow states to cooperate in the absence of hegemony. International regimes are defined as sets of "principles, norms, rules, and decisionmaking procedures around which actors' expectations converge."¹⁶ As in CPR dilemmas, these constraints on individual behavior can benefit all, allowing them to achieve cooperative outcomes that are in each individual's long-term self-interest. Keohane identifies a number of functions that international institutions or regimes can perform that facilitate states' pursuit of common interests. These functions include provision of information about others' actions and preferences, issue linkage, reduction in transaction costs, and so on.¹⁷ The focus on rules results in part from observation of actual cooperation, as in CPRs, as the contrast between the collapse of international cooperation in the 1930s and continued cooperation in the 1970s and 1980s called hegemonic stability theory into serious question.

However, few international institutions have acquired enforcement powers of their own. If enforcement takes place at all, for example as in the General Agreement on Tariffs and Trade (GATT), it is decentralized enforcement by members. Thus, the

study of international institutions has led to consideration of solutions to collective action problems that are isomorphic to those considered by CPR students. Neither relies on external agency--because it is not available on the international level, and not considered efficient for local CPRs. Discussion of international cooperation focuses on the role of institutions in making reputations valuable and facilitating agreements.

Similarly, the systems of rules studied in CPRs are claimed to address three problems: the supply of new institutions, credible commitments, and mutual monitoring.¹⁸ Of these three, the first has received relatively little attention in international politics, as analysts have often assumed that institutions are constructed by former hegemon or arise in some other exogenous manner. Instead, attention has been focused on adherence to the norms and rules of existing institutions.

Studies showing the successful solution of international cooperation dilemmas and the role of institutions in such success have been accumulating over the last few years. Analysts have studied patterns of cooperation among states on commercial and financial issues, on security affairs, and on economic sanctions, among others.¹⁹ While no final verdict is in on the appropriate explanations of observed patterns, these studies demonstrate the ability of states to at times solve the collective problems facing them. Thus, both the CPR and international cooperation research programs have successfully met the existence proof challenge with theoretical and empirical work demonstrating the

possibility of decentralized solutions.

As this discussion suggests, the parallels between the two research programs are clear. Both confront similar analytical concerns, primarily the explanation of decentralized cooperation given temptations to act opportunistically and to free ride. Both assume rational (or boundedly rational) individuals acting in environments of interdependence, uncertainty, and costly monitoring and enforcement. Both have turned to examination of institutions as sets of rules to consider the nature of decentralized solutions. And both have been preoccupied with responding to prevailing pessimism about the possibility of decentralized solutions, thus focusing on establishing their existence. The next section suggests the need to go beyond this first step to begin explaining variations in the level of success and in institutional design.

The Explanation of Variation. Most new research programs begin as an attempt to explain anomalies in currently accepted paradigms, such as the observation of successful decentralized cooperation in CPRs. However, the success of a research program does not turn solely on its ability to explain such anomalies. A successful endeavor generates theories and models that lead to the discovery of new facts, and that go beyond competing programs in finding and making sense of empirical puzzles and patterns. The CPR and international cooperation research programs are now at this stage. Having developed a plausible explanation of the

anomaly of cooperative solutions, what new puzzles should they tackle? Here, I consider the ability of these programs to address two related puzzles: variation in the success and failure of cooperation, and variation in the design of institutions that contribute to such success or failure. Both research programs have made some progress on the former, while studies of CPR have paid more attention to issues of institutional design than have studies of international cooperation.

In international relations, the development of hypotheses about the conditions under which states will successfully cooperate has in part taken a deductive approach. Using game theory as a heuristic device, analysts have specified the factors they believe will facilitate cooperation. While this work has progressed in tandem with empirical work on explanations of cooperation, little systematic testing of hypotheses has yet taken place, perhaps due to the difficulty of observing or measuring some of the key variables specified in the existing hypotheses. One theoretical consideration of the structural factors likely to facilitate cooperation, that of Robert Axelrod and Robert Keohane, focused on three factors: the level of common interest among states, the shadow of the future, and the number of actors.²⁰ Case studies have suggested the plausibility of these factors as explanations of cooperation, but cannot yet be considered to have definitively established statistically significant patterns.

The logic underlying development of these hypotheses derives

from consideration of the nature of strategic interaction among states. The proposition that states will have an easier time cooperating when they have a greater interest in doing so is apparently so straightforward as to require little justification. However, a couple of difficulties arise in using this hypothesis to explain patterns of cooperation. The primary problem is that of independently identifying the degree of common interest. This is a difficult concept to measure or observe. If we wish to test the hypothesis that common interests lead to cooperation, we have to exercise extreme care to avoid inferring mutuality of interest from cooperative outcomes. Thus, this explanation may be most valuable from an analytical viewpoint in issue-areas with well-defined theories of state interests, even if it is "true" in general. A second difficulty is somewhat more counterintuitive. Recent works using game theory have demonstrated the possibility of cooperation even in games with a very low degree of common interest, such as those dominated by a concern for relative rather than absolute gains.²¹ One analysis has even found that given many players, the shadow of the future necessary to sustain cooperation in equilibrium actually decreases when relative gains are taken into account. These works suggest that our intuitive notions about the impact of mutuality of interest may need further refinement and attention to interaction with other structural factors.

Axelrod and Keohane suggest that iteration, or the shadow of the future, is a second structural explanation of cooperation.

Their argument follows from analysis of the repeated Prisoners' Dilemma. In this game, both experimental and formal work shows that some minimum value placed on future plays of the game is necessary for players to sustain a cooperative equilibrium. Without a sufficiently high value for the future (i.e., if players' discount rates are high or if the game is only repeated a few times), the immediate gains to defection will outweigh the longer-term costs of punishment, thus leading rational actors to defect even if credible punishment strategies are in place. Again, there seems to be some general support for this proposition in the observation that cooperation often collapses when states are forced to consider only the immediate future, as in the 1930s.²²

This proposition suffers from drawbacks similar to those identified for the common interests proposition. One is empirical, in that discount rates are typically private information, difficult to observe, and therefore perhaps not an optimal choice as an explanatory variable. A second drawback comes from the focus on Prisoners' Dilemma. While iteration is conducive to cooperation in collaboration games such as PD, it has the opposite effect in coordination games such as Battle of the Sexes or Chicken.²³ In such coordination games with multiple equilibria and distributional implications, players disagree on the preferred equilibrium. Although they have no incentive unilaterally to move away even from their least-preferred equilibrium, they may be willing to bear the immediate

costs of defection if they care enough about the future to attempt to force joint movement to a different equilibrium. Thus, a low discount rate may actually increase incentives to defect in coordination games.²⁴

The number of players is a third structural factor hypothesized to affect the possibilities for international cooperation. This proposition relies on reasoning about uncertainty and the costs of monitoring. The more states involved in any cooperation problem, the greater the chances of undetected defection or, to restate the problem, the greater the costs of effective monitoring. Unlike the previous two factors, measurement of the number of players should be relatively straightforward, although it may be best to treat the number as endogenous rather than exogenous in many cooperation problems. Also, the logic of the impact of numbers on cooperation seems quite robust, although Snidal's analysis of the cooperation when players care about relative gains suggests one potential counter-example.²⁵

Students of CPRs, while sometimes using game theory in the same heuristic manner as the works just discussed, have been more openly inductive in their approach to developing hypotheses about the factors that contribute to successful cooperative solutions. This research program benefits from a large number of case studies that address similar issues using a common language, thus contributing to the accumulation of empirical insights and the identification of patterns. Researchers in the Workshop in

Political Theory and Policy Analysis at Indiana University have begun constructing a data base coding various dimensions of different CPRs, which should eventually allow for more rigorous testing and development of hypotheses.²⁶ At this stage, as in the literature on international cooperation, CPR students can offer mainly preliminary suggestions about the factors that contribute to successful organization. In contrast to the international cooperation program, however, CPR students offer insights into both structural factors and institutional design. Those who study international cooperation have not yet seriously considered institutional design, focusing on the existence or lack of an institutional framework as an explanatory factor rather than on the internal characteristics of regimes.

In Ostrom's study of a range of CPR dilemmas, she finds a number of structural factors that seem to be strongly correlated with institutional performance, which are referred to as "situational variables."²⁷ Nine factors achieve prominence in this analysis: (1) the number of appropriators, (2) size of the CPR, (3) temporal and spatial variability of the resource units, (4) current condition of CPR, (5) market conditions for resource units, (6) amount and type of conflict, (7) availability of data, (8) status quo rules, and (9) new, proposed rules. I will leave the latter two, regarding the nature of rules, to the following discussion of institutional design. Two of these factors, the current condition of the CPR and market conditions (4 and 5), may be specific to analysis of CPRs and difficult (although perhaps

not impossible) to generalize to other settings.

The remaining situational variables can be, for ease of comparison to results on international cooperation, aggregated into three categories: number of actors (1 and 2), mutuality of interests (3 and 6), and level of uncertainty (7). The similarities between these factors and those identified in the international cooperation program are striking. Both the number of appropriators and the size of the CPR affect possibilities of cooperation in much the same manner as the number of players should affect the possibility of international cooperation. In fact, the ability to limit access to the CPR seems to be close to a necessary condition for successful organization, whether centralized or decentralized. This is rather a troubling finding when considering the implications for global rather than local commons, since limiting access is likely to be extremely costly on the global level.

Mutuality of interests also affects the likelihood of cooperation in much the same way for CPRs and on the international level. Ostrom's analysis suggests that we may be able to disaggregate the concept of common interests. One dimension is a raw measure of conflict that exists between equivalent players. Are players in a harmony game, a Prisoners' Dilemma, or a zero-sum game? This distinction is identical to that discussed by Axelrod and Keohane. However, the CPR work suggests a second dimension: the heterogeneity of players. This dimension focuses not on the conflict generated by homogeneous

preference orderings, but on the possibility that different players have different orderings, perhaps due to different resource endowments, variability in resource flows, or other structural factors. Ostrom suggests that heterogeneity complicates attempts to cooperate, and observation of CPRs seems to back this up.²⁸

The impact of heterogeneity, however, may be one issue on which more sustained theoretical and empirical analysis would prove fruitful. While the CPR findings seem intuitive, work on international cooperation brings them into question. For example, the theory of hegemonic stability posits just the opposite: that the greater the disparity in power among states, the more likely they will cooperate. Models of costly contribution to public goods back up this kind of argument, suggesting that heterogeneity is not necessarily an impediment to provision and may even facilitate it.²⁹ A different line of analysis, that of tactical issue-linkage in international politics, also suggests that heterogeneity may have its beneficial side. If different states have intense preferences on different issues, room exists for bargains and deals that make all better off.³⁰ On this dimension, the insights from the international cooperation program are somewhat more optimistic for those considering the global commons than are the insights from CPRs, since the existence of heterogeneous interests among states in controlling environmental threats may provide room for cross-issue linkages and mutually beneficial deals rather than

threatening the possibility of cooperation.

Ostrom focuses on uncertainty as the third general class of situational variables that has an observable impact on success. This focus is inherent in Axelrod and Keohane's discussion, for example in their contention that increasing the number of players makes cooperation more difficult. However, the impact of uncertainty on international cooperation has received the most attention from those who study "epistemic communities," groups of experts who develop specialized knowledge about cause/effect relationships in policy-relevant issue-areas.³¹ Studies of attempts to cooperate in areas characterized by high levels of uncertainty about the relationships between policies and outcomes, such as the environment or public health, have generally concluded that such uncertainty is a barrier to cooperation.³² Without a consensus on what will work, who will bear the costs, and who will gain the benefits, countries find it difficult to act in a far-sighted manner, these studies suggest. However, the possibility also exists that improved understanding of the complexities of a particular issue will only reveal clear patterns of winners and losers, thus forcing states to rely on specific rather than diffuse reciprocity.³³ Again, this is one area in which greater use of formal modeling techniques may be valuable, since such models increasingly allow us to determine more precisely the effects of different types and levels of uncertainty.³⁴

Work on CPRs goes beyond consideration of structural

variables to speculate on the impact of various principles of institutional design on the ability of appropriators to organize. This is one area in which studies of international cooperation and institutions could draw important lessons, since such studies typically treat institutions as a black box, or a dichotomous variable rather than considering the internal characteristics of the institution as an explanatory factor.³⁵ Institutional design is a difficult concept to approach analytically, since it is clearly both a dependent and an independent variable. As students of cooperation, we are interested in the effects of different rules and procedures on outcomes. However, both to develop a complete understanding of institutions and to offer policy-relevant insights, we need to conceive of institutional design as something over which individuals or states exert control.

Thus, we need to confront the question of the origins of institutions. Ostrom finds that institutions evolve over time as the result of learning from experience, as a kind of trial-and-error process.³⁶ Individuals rarely are able to calculate the exact effects of proposed rule changes and adopt or reject them on a clearcut cost-benefit basis. However, from an analytical perspective, adopting the simplifying assumption that individuals do make choices on such a rational, far-sighted basis may provide us with the analytical leverage to address institutions as both objects of choice and constraints on outcomes. Indeed, only because institutions constrain outcomes once in place do they

become interesting objects of choice. Political economists have begun to think about institutions in this way. Their models typically assume some substantive problem, such as the choice of inflation rates or levels of tariff protection. The game they posit begins with an institutional design stage followed by a game stage, in which policies are chosen within the constraints determined in the first stage. Given rational, far-sighted behavior, the choice of institutions is then dependent on their anticipated effects on policy outcomes at the end of the game. Individuals do not have preferences over institutions themselves, but choose among institutions based on their impact on economic or other outcomes.³⁷

Ostrom's analysis of empirical CPR situations leads her to suggest eight institutional design principles that seem to be correlated with institutional performance: (1) clear boundaries and memberships, (2) congruent rules, (3) collective-choice arenas, (4) monitoring, (5) graduated sanctions, (6) conflict-resolution mechanisms, (7) recognized rights to organize, and (8) nested units. Of these, three (1, 7, and 8) may perhaps be considered structural variables rather than design principles, since they refer as much to the external setting of the institution as the internal functioning. Monitoring, graduated sanctions, and conflict-resolution mechanisms (4, 5, and 6) coexist in successful organizations. This finding follows from consideration of the nature of CPR or collaboration problems, in which temptations to free-ride require the establishment of

credible punishment mechanisms if a cooperative equilibrium is to be sustained. These three mechanisms likely enhance the credibility of punishment schemes.³⁸

Ostrom suggests that rules must be "congruent" if they are to succeed. Further research on what makes rules "congruent" may present a fruitful avenue for development of more testable hypotheses about the conditions for cooperation. The conclusion of current CPR studies seems to be that it is nearly impossible to specify in general the characteristics that will make rules congruent, due to the complexity of actual collective action problems. Indeed, such studies argue that this is one of the key reasons that government intervention fails, as it is not adequately sensitive to the specific and unique demands of each CPR. The need for congruent rules combined with the existence of uncertainty creates a presumption in favor of letting appropriators design their own institutions.

This insight leads to another design principle: collective-choice arenas. Both the logic of institutional choice outlined here and empirical studies of CPRs give a key role to the process through which those with a stake in an institution choose its rules. The constitutional setting in which this choice takes place can have a major impact on institutional design and therefore on outcomes. For example, thinking about international cooperation, it is unlikely that the rules chosen by a hegemonic actor would be the same as those chosen by majority vote among interested states. Sensitivity to the effects of collective-

choice arenas is evident in recent decisions within the European Community, where governments and have devoted a great deal of effort to determining the precise range of issues to which qualified majority voting should apply and to the design of a European Central Bank.³⁹

Overall, both the research program in international cooperation and that in CPRs have begun to take steps beyond proving that "self-enforcement is possible" to identify the conditions under which it occurs. The development of these hypotheses has built on theoretical analysis of collective choice and inductive analysis of cooperation problems. With regard to structural variables, there is significant overlap between the two research programs, as they have identified many of the same factors as influential. However, further work is needed to specify the impact of some variables, particularly heterogeneity of interests and of uncertainty. The CPR program has moved further than that in international cooperation toward the analysis of institutional design. As this is one area over which individuals and states can actively exercise choice and reasoned consideration of various options, it seems an area worthy of more sustained attention from both research programs.

Appreciating Diversity. Thus far, this paper has stressed the similarities in the development of two research programs. By way of conclusion, I will briefly suggest some caveats to this convergence by highlighting substantive differences between CPRs

and international cooperation problems that should caution us against facile transportation of models across disciplinary boundaries.

As discussed above, one area in which the findings of those studying CPRs and those studying international cooperation may contradict one another is on the impact of heterogeneity of interests or capabilities. While solutions to common-pool resource problems appear easiest in situations where players closely resemble one another, students of international politics have found theoretical justification for cooperation facilitated by heterogeneity. These conflicting implications result from the fact that many international cooperation problems do not have the characteristics of CPRs. Asymmetries of power, economic interests, ties to other countries, etc., often create situations where states have preferences that diverge in significant ways from the Prisoners' Dilemma situation assumed in CPR problems. For example, one version of hegemonic stability theory, that suggested initially by Kindleberger and developed by Snidal, argues that control over a large share of world economic resources leads hegemons to have an interest in unilaterally supplying public goods.⁴⁰ In this instance, it is precisely the disproportionate share of resources held by one actor that contributes to production of the public good.

In other instances, states cooperate because they are heterogeneous in the degree to which they care about different issues. For example, in 1982 Britain gained cooperation in its

economic sanctions against Argentina during the Falklands War by trading off concessions on European Community issues for support on sanctions.⁴¹ In recent negotiations within the EC, some analysts have argued that Germany, with an overriding interest in political union, traded off concessions on the design of European Monetary Union for concessions from other members on political issues. In instances such as this, bargaining models become more relevant and have greater explanatory power than models of collective action. Global environmental problems clearly have some of this heterogeneous character, as the interests of developing countries are not identical to those of developed, wealthy countries. However, this asymmetry may prove more of an opportunity than a hindrance to cooperation as it opens possibilities for creative use of issue-linkages and side-payments. This attention on bargaining, however, does not mean that analysts can turn their attention away from issues of institutional design. Instead, the question becomes one of constructing international institutions that lend credibility to inherently fragile cross-issue linkages. At the same time, the problems of monitoring and sanctions identified by the CPR literature remain relevant, even in bargaining games.

A second major way in which international cooperation problems differ from CPR problems is what Robert Putnam refers to as the "two-level game" nature of international cooperation.⁴² In most instances of international cooperation, governments undertake negotiations and commit themselves to adopt particular

policies. However, governments typically cannot implement such policies without some minimum level of domestic support. Even in authoritarian states, some formal or informal "ratification process" must take place for policies to be adopted, since the "government" is not a unitary actor, nor does it have control over all actors within the state that affect international outcomes. This separation of negotiating and implementation authority can lead to "involuntary defection," where governments that commit in good faith to international agreements cannot carry through on their promises. The specter of involuntary defection can make other states reluctant to conclude agreements. This problem has arisen in all conceivable issue-areas, including the environment. For example, commitments by countries with large rain forests to slow harvesting have run afoul of enforcement problems, since governments of some developing countries lack the resources to exert such control regardless of their intentions.

In CPRs, while some analyses have noted multiple levels of cooperation problems,⁴³ this is a relatively rare issue. Most often, the individuals involved in decentralized solutions are themselves the fishers or farmers utilizing the resource, and have control over their own actions. To this extent, the literature on international cooperation may provide insights not fully developed in the CPR literature. One collection of case studies has explored the propositions developed by Putnam's analysis of two-level games, tentatively suggesting factors that

affect cooperation in such situations.⁴⁴ Another potential source of leverage on such problems comes from formal rather than inductive analysis, such as that linking electoral politics to international economic policy.⁴⁵ These analyses suggest that multiple levels of authority are not always a negative factor in cooperation problems. Instead, governments may find ways to use international leverage to solve their domestic problems, or otherwise discover "synergistic linkages" not available to unitary actors.⁴⁶ While numerous parallels exist between CPR and international cooperation problems, the fact that international cooperation always involves heterogeneous and non-unitary actors introduces unique elements into such issues that suggest the insights of CPR work may require some revision when transported from the local to the global level.

Notes

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17. Keohane, After Hegemony, chapter 6, pp. 85-109.

18. Ostrom, Governing the Commons, pp. 42-45.

19. For examples, see Kenneth A. Oye, ed., Cooperation Under Anarchy (Princeton: Princeton University Press, 1986); Lisa L. Martin, Coercive Cooperation: Explaining Multilateral Economic Sanctions (Princeton: Princeton University Press, 1992); Arthur A. Stein, Why Nations Cooperate: Circumstance and Choice in International Relations (Ithaca: Cornell University Press, 1990).

20. Robert Axelrod and Robert O. Keohane, "Achieving Cooperation Under Anarchy: Strategies and Institutions," in Oye, ed., pp. 226-54.

21. See Duncan Snidal, "Relative Gains and the Pattern of International Cooperation," American Political Science Review 85, no. 3 (September 1991), pp. 701-26; Robert Powell, "Absolute and Relative Gains in International Relations Theory," American Political Science Review 85, no. 4 (December 1991), pp. 1303-20.

22. See Kenneth A. Oye, "The Sterling-Dollar-Franc Triangle: Monetary Diplomacy 1929-1937," in Oye, ed., pp. 173-99.

23. For the distinction between collaboration and coordination, see Arthur A. Stein, "Coordination and Collaboration: Regimes in an Anarchic World," International Organization 36 (Spring 1982), pp. 299-324.

24. See Lisa L. Martin, "Interests, Power, and Multilateralism," International Organization, forthcoming Autumn 1992.

25. Snidal, "Relative Gains," p. 718.

26. See Shui Yan Tang, "Institutional Arrangements and the Management of Common-Pool Resources," Public Administration Review 51, no. 1 (January/February 1991), pp. 42-51.

27. See Ostrom, Governing the Commons, p. 197.

28. For example, see *ibid.*, p. 166. Ostrom describes the failure of irrigation projects in Sri Lanka, where diversity of backgrounds contributed to an inability to organize.

29. Christopher Bliss and Barry Nalebuff, "Dragon-Slaying and Ballroom Dancing: The Private Supply of a Public Good," Journal of Public Economics 25 (1984), pp. 1-12; Thomas R. Palfrey and Howard Rosenthal, "Participation and Provision of Discrete Public Goods: A Strategic Analysis," Journal of Public Economics 24 (1984), pp. 171-93.

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31. For studies of the impact of epistemic communities, see Peter M. Haas, Saving the Mediterranean: The Politics of International Environmental Cooperation (New York: Columbia University Press, 1990); special issue of International Organization on "Knowledge, Power, and International Policy Coordination," ed. Peter M. Haas, vol. 46, no. 1 (Winter 1992).

32. Haas, Saving the Mediterranean; Richard N. Cooper, "International Cooperation in Public Health as a Prologue to Macroeconomic Cooperation," in Richard N. Cooper et al., Can Nations Agree? Issues in International Economic Cooperation (Washington, D.C.: The Brookings Institution, 1989), pp. 178-254.

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34. Two developments in game theory seem particularly relevant here: studies of reputation and signaling, and of delegation to policy experts under conditions of uncertainty. On the former, see Kreps and Wilson, "Reputation and Imperfect Information;" Kreps and Wilson, "Sequential Equilibrium," Econometrica 50 (1982), pp. 863-94; Michael Spence, Market Signaling (Cambridge,

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35. For one exception, see Christopher Holoman, "Exchange Rate Systems, Institutional Design, and Cooperation," mimeo, Department of Political Science, State University of New York at Buffalo, January 1992.

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38. For experimental evidence on monitoring and sanctions, see James Walker, Roy Gardner, and Elinor Ostrom, "Sanctioning by Participants in Collective Action Problems," Workshop in Political Theory and Policy Analysis Working Paper 91-1, Indiana University, January 11, 1991.

39. See Andrew Moravcsik, "Negotiating the Single European Act: National Interests and Conventional Statecraft in the European Community," International Organization 45, no. 1 (Winter 1991), pp. 19-56; Geoffrey Garrett, "International Cooperation and Institutional Choice: The European Community's Internal Market," International Organization (Spring 1992).

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41. Lisa L. Martin, "Institutions and Cooperation: Sanctions During the Falklands War," International Security (Spring 1992).

42. Robert D. Putnam, "Diplomacy and Domestic Politics: The Logic of Two-Level Games," International Organization 42, no. 3 (Summer 1988), pp. 427-60.

43. Sandberg, p. 7.

44. Peter Evans, Harold K. Jacobson, and Robert D. Putnam, eds., International Bargaining and Domestic Politics: An Interactive Approach (Berkeley: University of California Press, forthcoming).

45. See Susanne Lohmann, "Electoral Cycles and International Policy Cooperation," Research Paper No. 1128a, Graduate School of Business, Stanford University, November 1991; Gregory D. Hess and Athanasios Orphanides, "War Politics: An Economic, Rational Voter Framework," prepared for the NBER Conference on Political Economics, Cambridge, Mass., November 15-16, 1991.

46. Putnam, p. 447.